

What is claimed is:

1. A controlled release agricultural absorbent based  
5 product comprising:  
particles of an absorbent material containing  
capillaries/voids between 10-200 microns in cross-sectional  
diameter which is impregnated in an amount of 40-95 % of the  
capillaries/voids volume with an agriculturally beneficial  
10 material selected from the group consisting of fertilizers,  
insecticides, herbicides and fungicides.

2. The controlled release agricultural absorbent based  
15 product of claim 1 wherein the absorbent material is selected  
from the group consisting of expanded perlite, shredded  
newspaper, saw dusts, cotton lint, ground corn cobs, corn cob  
flower, Metrecz absorbent and diatomaceous earth.

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3. The controlled release agricultural absorbent based  
product of claim 1, wherein the capillaries and voids are  
between 40 and 100 microns in cross-sectional diameter.

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4. The controlled release agricultural absorbent based product of claim 1, wherein the absorbent is impregnated in an amount of 70-95 % wt of the agricultural beneficial material.

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5. The controlled release agricultural absorbent based product of claim 1, wherein the absorbent particles are 100-1500 microns in diameter.

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6. The controlled release agricultural absorbent based product of claim 1, wherein the absorbent particles are 150-1000 microns in diameter.

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7. The controlled release agricultural absorbent based product of claim 1, wherein the fertilizer is secondary nutrients selected from the group consisting of sulfur, calcium and magnesium.

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8. The controlled release agricultural absorbent based product of claim 1, wherein the fertilizer is micronutrients selected from the group consisting of boron, copper, iron, manganese, molybdenum and zinc.

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9. The controlled release agricultural absorbent based product of claim 1, wherein the fertilizer is selected from the group consisting of nitrogen compounds, phosphorous compounds and potassium compounds.

10. The controlled release agricultural absorbent based product of claim 9, wherein the nitrogen compounds are selected from the group consisting of urea, ammonia, ammonium nitrate, ammonium sulfate, calcium nitrate, diammonium phosphate, monoammonium phosphate, potassium nitrate and sodium nitrate.

11. The controlled release agricultural absorbent based product of claim 9, wherein the phosphorous compounds are selected from the group consisting of diammonium phosphate, monoammonium phosphate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

12. The controlled release agricultural absorbent based product of claim 9, wherein the potassium compound is selected from the group consisting of potassium chloride, potassium

nitrate, potassium sulfate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

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13. The controlled release agricultural absorbent based product of claim 9, wherein the fertilizer contains nitrogen, phosphorous and potassium compounds in a ratio selected from the group consisting of 29-3-4, 16-4-8, 10-10-10, 15-5-10, 15-0-15, 22-3-14, 20-28-5 and 12-6-6.

14. The controlled release agricultural absorbent based product of claim 1, wherein the fertilizer is a nitrification regulator selected from the group consisting of 2-chloro-6 trichloromethyl)pyridine, sulfathiazole, dicyandiamide, thiourea, and guanylthiourea.

15 A controlled release agricultural absorbent based product comprising:  
particles of an absorbent material containing capillaries/voids between 10-200 microns in cross-sectional diameter which is impregnated in an amount of 40-95 % of the capillaries/voids volume with an agriculturally beneficial material selected from the group consisting of fertilizers,

insecticides, herbicides and fungicides, said particles of absorbent material being agglomerated into granules.

5           16. The controlled release agricultural absorbent based product of claim 15 wherein the particles are agglomerated into granules having a size of 0.2 - 25 mm in diameter.

10           17. The controlled release agricultural absorbent based product of claim 15 wherein the particles are agglomerated into granules having a size of 1 - 4 mm in diameter.

15           18. The controlled release agricultural absorbent based product of claim 15 wherein the absorbent material is selected from the group consisting of expanded perlite, shredded newspaper, saw dusts, cotton lint, ground corn cobs, corn cob flower, Metrecz absorbent and diatomaceous earth.

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          19. The controlled release agricultural absorbent based product of claim 15, wherein the capillaries and voids are between 40 and 100 microns in cross-sectional diameter.

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20. The controlled release agricultural absorbent based product of claim 15, wherein the absorbent is impregnated in an amount of 70-95 % wt of the agricultural beneficial material.

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21. The controlled release agricultural absorbent based product of claim 15, wherein the absorbent particles are 100-1500 microns in diameter.

22. The controlled release agricultural absorbent based product of claim 15, wherein the absorbent particles are 150-1000 microns in diameter.

23. The controlled release agricultural absorbent based product of claim 15, wherein the fertilizer is secondary nutrients selected from the group consisting of sulfur, calcium and magnesium.

24. The controlled release agricultural absorbent based product of claim 15, wherein the fertilizer is micronutrients selected from the group consisting of boron, copper, iron, manganese, molybdenum and zinc.

25. The controlled release agricultural absorbent based product of claim 15, wherein the fertilizer is selected from the group consisting of nitrogen compounds, phosphorous compounds and potassium compounds.

26. The controlled release agricultural absorbent based product of claim 25, wherein the nitrogen compounds are selected from the group consisting of urea, ammonia, ammonium nitrate, ammonium sulfate, calcium nitrate, diammonium phosphate, monoammonium phosphate, potassium nitrate and sodium nitrate.

27. The controlled release agricultural absorbent based product of claim 25, wherein the phosphorous compounds are selected from the group consisting of diammonium phosphate, monoammonium phosphate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

28. The controlled release agricultural absorbent based product of claim 25, wherein the potassium compound is

selected from the group consisting of potassium chloride, potassium nitrate, potassium sulfate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

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29. The controlled release agricultural absorbent based product of claim 25, wherein the fertilizer contains nitrogen, phosphorous and potassium compounds in a ratio selected from the group consisting of 29-3-4, 16-4-8, 10-10-10, 15-5-10, 15-0-15, 22-3-14, 20-28-5 and 12-6-6.

30. The controlled release agricultural absorbent based product of claim 15, wherein the fertilizer is a growth regulator selected from the group consisting of potassium azide, 2 amino-4-chloro-6-methyl pyrimidine, N-2, 5-dicorphenyl succinamide, 4-amino-1, and 2,4-triazole hydrochloride.

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31. The controlled release agricultural absorbent based product of claim 15, wherein the fertilizer is a nitrification regulator selected from the group consisting of 2-chloro-6 trichloromethyl)pyridine, sulfathiazole, dicyandiamide, thiourea, and guanylthiourea.



32. The controlled release agricultural absorbent based product of claim 15, wherein the insecticide is 0,0-diethyl O-  
5 (2-isopropyl-6 methyl- 4 pyrimidinyl) phosphorothioate).

33. The controlled release agricultural absorbent based product of claim 15, wherein the herbicide is 2,4-  
10 dichlorophenoxyacetic acid.

34. The controlled release agricultural absorbent based product of claim 15, wherein the fungicide is ferric-di-  
15 methyl-dithiocarbamate.

35. A controlled release agricultural absorbent based product comprising:  
20 a particulate absorbent material containing capillaries/voids between 10-200 microns in cross-sectional diameter which is impregnated in an amount of 40-95 % of the capillaries/voids volume with a mixture of an interspatial blocker and an agriculturally beneficial material selected from the group  
25 consisting of fertilizers, insecticides, herbicides and fungicides.

36. The controlled release agricultural absorbent based product of claim 35 wherein the interspatial blocker is a material selected from the group consisting of plant starches, protein gels, glues, gumming compositions, crystallizing compounds, gelling clays, and synthetic gel forming compounds.

37. The controlled release agricultural absorbent based product of claim 35 wherein the interspatial blocker is a starch selected from the group consisting of corn starch, rice starch, potato starch, wheat starch, tapioca starch, starch containing D-glucopyranose polymers, amylose and amylopectin. starch acetates, starch esters, starch ethers, starch phosphates

38. The controlled release agricultural absorbent based product of claim 35 wherein the interspatial blocker is corn starch or wheat starch.

39. The controlled release agricultural absorbent based product of claim 35 wherein the starches are modified by



44. The controlled release agricultural absorbent based product of claim 35 wherein the interspatial blocker is a  
5 crystallizing compound selected from the group consisting of sodium silicate, phosphate cements, calcium-oxide cements and hydraulic cements.

45. The controlled release agricultural absorbent based product of claim 35 wherein the interspatial blocker is a  
gelling clay.

46. The controlled release agricultural absorbent based product of claim 35 wherein the interspatial blocker is a  
synthetic gel forming compound selected from the group  
consisting of polysulfide sealants, polyethylene, isobutylene,  
polyamides, polyvinyl acetate, epoxy, phenolformaldehyde, urea  
20 formaldehyde, polyvinyl butyral, cyanoacrylates and silicone cements.

47. The controlled release agricultural absorbent based  
25 product of claim 35 wherein the interspatial blocker is present in an amount of 0.01 - 20 % wt.

48. The controlled release agricultural absorbent based product of claim 35 wherein the interspatial blocker is present in an amount of 0.2-10 % wt.

49. The controlled release agricultural absorbent based product of claim 35 wherein the interspatial blocker is present in an amount of 0.5-4 % wt.

50. A controlled release agricultural absorbent based product comprising:  
particles of expanded perlite as an absorbent material, containing capillaries/voids between 10-200 microns in cross-sectional diameter, which is impregnated in an amount of 40-95 % of the capillaries/voids volume with an agriculturally beneficial material selected from the group consisting of fertilizers, insecticides, herbicides and fungicides.

51. The controlled release agricultural absorbent based product of claim 50 wherein the particles are agglomerated into granules.

52. The controlled release agricultural absorbent based product of claim 50 wherein the particles are agglomerated into granules having a size of 0.2 - 25 mm in diameter.

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53. The controlled release agricultural absorbent based product of claim 50 wherein the particles are agglomerated into granules having a size of 1 - 4 mm in diameter.

54. The controlled release agricultural absorbent based product of claim 50 wherein the perlite is exfoliated perlite.

55. The controlled release agricultural absorbent based product of claim 50 wherein the fertilizer is urea and the resulting absorbent contains 40-45 % wt. nitrogen.

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56. The controlled release agricultural absorbent based product of claim 50 wherein the fertilizer is urea and the resulting absorbent contains 43-44 % wt. nitrogen.

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57. The controlled release agricultural absorbent based product of claim 50 wherein the fertilizer is urea and the resulting absorbent has a bulk density of 25-43 lb/ft<sup>3</sup>.

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58. The controlled release agricultural absorbent based product of claim 50 wherein the fertilizer is urea and the resulting absorbent has a bulk density of 38-46 lb/ft<sup>3</sup>.

59. A controlled release agricultural absorbent based product comprising:  
particles of expanded perlite as an absorbent material,  
containing capillaries/voids between 10-200 microns in cross-sectional diameter, which is impregnated in an amount of 40-95 % of the capillaries/voids volume with a mixture of an interspatial blocker and an agriculturally beneficial material selected from the group consisting of fertilizers, insecticides, herbicides and fungicides.

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60. The controlled release agricultural absorbent based product of claim 59 wherein the particles are agglomerated into granules.

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61. The controlled release agricultural absorbent based product of claim 59 wherein the particles are agglomerated into granules having a size of 0.2 - 25 mm in diameter.

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62. The controlled release agricultural absorbent based product of claim 59 wherein the particles are agglomerated into granules having a size of 1 - 4 mm in diameter.

63 A controlled release agricultural absorbent based product comprising:  
particles of exfoliated perlite as an absorbent material,  
containing capillaries/voids between 10-200 microns in cross-sectional diameter, which is impregnated in an amount of 40-95 % of the capillaries/voids volume with a mixture of an interspatial blocker and an agriculturally beneficial material selected from the group consisting of fertilizers, insecticides, herbicides and fungicides.

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64. The controlled release agricultural absorbent based product of claim 63 wherein the particles are agglomerated into granules.

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65. The controlled release agricultural absorbent based product of claim 63 wherein the particles are agglomerated into granules having a size of 0.2 - 25 mm in diameter.

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66. The controlled release agricultural absorbent based product of claim 63 wherein the particles are agglomerated into granules having a size of 1 - 4 mm in diameter.

67. The controlled release agricultural absorbent based product of claim 63 wherein the exfoliated perlite has a loose weight density of 2-20 lb/ft<sup>3</sup>.

68. The controlled release agricultural absorbent based product of claim 63 wherein the exfoliated perlite has a loose weight density of 2-6 lb/ft<sup>3</sup>.

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69. A controlled release agricultural absorbent based product comprising:  
particulate exfoliated perlite as an absorbent material,  
containing capillaries/voids between 10-200 microns in cross-  
sectional diameter, which is impregnated in an amount of 40-95  
% of the capillaries/voids volume with a mixture of a

vegetable starch and an agriculturally beneficial material selected from the group consisting of fertilizers, insecticides, herbicides and fungicides, said particles of exfoliated perlite being agglomerated into granules.

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70. The controlled release agricultural absorbent based product of claim 69 wherein the granules have a size of 0.2 - 25 mm in diameter.

71. The controlled release agricultural absorbent based product of claim 69 wherein the granules have a size of 1 - 4 mm in diameter.

72. The controlled release agricultural absorbent based product of claim 69, wherein the fertilizer is selected from the group consisting of nitrogen compounds, phosphorous compounds and potassium compounds.

73. The controlled release agricultural absorbent based product of claim 72, wherein the nitrogen compounds are selected from the group consisting of urea, ammonia, ammonium nitrate, ammonium sulfate, calcium nitrate, diammonium

phosphate, monoammonium phosphate, potassium nitrate and sodium nitrate.

5           74. The controlled release agricultural absorbent based product of claim 72, wherein the phosphorous compounds are selected from the group consisting of diammonium phosphate, monoammonium phosphate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

75. The controlled release agricultural absorbent based product of claim 72, wherein the potassium compound is selected from the group consisting of potassium chloride, potassium nitrate, potassium sulfate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

20           76. The controlled release agricultural absorbent based product of claim 72, wherein the fertilizer contains nitrogen, phosphorous and potassium compounds in a ratio selected from the group consisting of 29-3-4, 16-4-8, 10-10-10, 15-5-10, 15-  
25 0-15, 22-3-14, 20-28-5 and 12-6-6.

77. The controlled release agricultural absorbent based product of claim 69 wherein the fertilizer is urea and the resulting absorbent contains 40-45 % wt. nitrogen.

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78. The controlled release agricultural absorbent based product of claim 69 wherein the fertilizer is urea and the resulting absorbent contains 43-44 % wt. nitrogen.

79. The controlled release agricultural absorbent based product of claim 69 wherein the fertilizer is urea and the resulting absorbent has a bulk density of 25-43 lb/ft<sup>3</sup>.

80. The controlled release agricultural absorbent based product of claim 69 wherein the fertilizer is urea and the resulting absorbent has a bulk density of 38-46 lb/ft<sup>3</sup>.

81. The controlled release agricultural absorbent based product of claim 69 wherein the vegetable starch is present in an amount of 0.01 - 20 % wt.

82. The controlled release agricultural absorbent based product of claim 69 wherein the vegetable starch is present in an amount of 2 - 8 % wt.

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83. The controlled release agricultural absorbent based product of claim 69 wherein the vegetable starch is present in an amount of 0.5 - 4 % wt.

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84. The controlled release agricultural absorbent based product of claim 69 wherein the vegetable starch is selected from the group consisting of corn starch, rice starch, potato starch, wheat starch and tapioca starch.

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85. The controlled release agricultural absorbent based product of claim 69 wherein the vegetable starch is corn starch or wheat starch.

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86. The controlled release agricultural absorbent based product of claim 69 wherein the perlite is impregnated in an amount of 60-90 % of the capillaries/voids volume.

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87. The controlled release agricultural absorbent based product of claim 69 wherein the perlite is impregnated in an amount of 80-90 % of the capillaries/voids volume.

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88. The controlled release agricultural absorbent based product of claim 69 wherein the exfoliated perlite has a loose weight density of 2-20 lb/ft<sup>3</sup>.

89. The controlled release agricultural absorbent based product of claim 69 wherein the exfoliated perlite has a loose weight density of 2-6 lb/ft<sup>3</sup>.

90. The controlled release agricultural absorbent based product of claim 69 wherein the hardness of the granules is 8-10 lbs of force for granules of 2.8 - 3.4 mm diameter.

91. The controlled release agricultural absorbent based product of claim 69 wherein the hardness of the granules is 0.9-1.1 lbs of force to 11-14 lbs of force for granules of 1-4 mm diameter.

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92. The controlled release agricultural absorbent based product of claim 69, wherein the fertilizer is secondary nutrients selected from the group consisting of sulfur, calcium and magnesium.

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93. The controlled release agricultural absorbent based product of claim 69, wherein the fertilizer is micronutrients selected from the group consisting of boron, copper, iron, manganese, molybdenum and zinc.

94. The controlled release agricultural absorbent based product of claim 69, wherein the fertilizer is a growth regulator selected from the group consisting of potassium azide, 2 amino-4-chloro-6-methyl pyrimidine, N-2, 5-dicorphenyl succinamide, 4-amino-1, and 2,4-triazole hydrochloride.

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95. The controlled release agricultural absorbent based product of claim 69, wherein the fertilizer is a nitrification regulator selected from the group consisting of 2-chloro-6 trichloromethyl)pyridine, sulfathiazole, dicyandiamide, thiourea, and guanylthiourea.

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96. The controlled release agricultural absorbent based product of claim 69, wherein the insecticide is 0,0-diethyl O-(2-isopropyl-6 methyl- 4 pyrimidinyl) phosphorothioate).

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97. The controlled release agricultural absorbent based product of claim 69, wherein the herbicide is 2,4-dichlorophenoxyacetic acid.

98. The controlled release agricultural absorbent based product of claim 69, wherein the fungicide is ferric-dimethyl-dithiocarbamate.

99. A controlled release agricultural product comprising:

a mixture of a control release holding substance selected from the group consisting of plant starches, protein gels, glues, gumming compositions, crystallizing compounds, gelling clays and synthetic gel forming compounds;

and an agriculturally beneficial material selected from the group consisting of fertilizers, insecticides, herbicides and fungicides, said agricultural product being in a particulate form.



100. The controlled release agricultural product of  
claim 99 wherein the holding substance is 4-8% wt of the  
5 agricultural product.

101. The controlled release agricultural product of  
claim 99 wherein the holding substance is a starch selected  
10 from the group consisting of corn starch, rice starch, potato  
starch, wheat starch, tapioca starch, starch containing D-  
glucopyranose polymers, amylose and amylopectin. starch  
acetates, starch esters, starch ethers, starch phosphates  
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102. The controlled release agricultural product of  
claim 99 wherein the interspatial blocker is corn starch or  
wheat starch.

20 103. The controlled release agricultural product of  
claim 99 wherein the starches are modified by acetylation,  
chlorination, acid hydrolysis or enzymatic action.

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104. The controlled release agricultural product of claim 99 wherein the holding substance is a starch selected from the group consisting of starch acetates, starch esters, starch ethers and starch phosphates.

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105. The controlled release agricultural product of claim 99 wherein the holding substance is a gelatin made by hydrolysis of collagen.

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106. The controlled release agricultural product of claim 99 wherein the holding substance is a glue made from a material selected from the group consisting of collagen, casein, blood and vegetable protein.

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107. The controlled release agricultural product of claim 99 wherein the holding substance is a gumming composition selected from the group consisting of cellulose, rubber latex, gums, terpene resins, mucilages, asphalts, pitches and hydrocarbon resins.

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108. The controlled release agricultural product of claim 99 wherein the holding substance is a crystallizing

compound selected from the group consisting of sodium silicate, phosphate cements, calcium-oxide cements and hydraulic cements.

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109. The controlled release agricultural product of claim 99 wherein the holding substance is a synthetic gel forming compound selected from the group consisting of polysulfide sealants, polyethylene, isobutylene, polyamides, polyvinyl acetate, epoxy, phenolformaldehyde, urea formaldehyde, polyvinyl butyral, cyanoacrylates and silicone cements.

110. The controlled release agricultural product of claim 99 wherein the interspatial blocker is a gelling clay.

111. The controlled release agricultural product of claim 99, wherein the fertilizer is secondary nutrients selected from the group consisting of sulfur, calcium and magnesium.

112. The controlled release agricultural product of claim 99, wherein the fertilizer is micronutrients selected

from the group consisting of boron, copper, iron, manganese, molybdenum and zinc.

5           113. The controlled release agricultural product of claim 99, wherein the fertilizer is selected from the group consisting of nitrogen compounds, phosphorous compounds and potassium compounds.

10           114. The controlled release agricultural product of claim 113, wherein the nitrogen compounds are selected from the group consisting of urea, ammonia, ammonium nitrate, ammonium sulfate, calcium nitrate, diammonium phosphate, 15 monoammonium phosphate, potassium nitrate and sodium nitrate.

20           115. The controlled release agricultural product of claim 113, wherein the phosphorous compounds are selected from the group consisting of diammonium phosphate, monoammonium phosphate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

25           116. The controlled release agricultural product of claim 113, wherein the potassium compound is selected from the

group consisting of potassium chloride, potassium nitrate, potassium sulfate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

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117. The controlled release agricultural product of claim 113, wherein the fertilizer contains nitrogen, phosphorous and potassium compounds in a ratio selected from the group consisting of 29-3-4, 16-4-8, 10-10-10, 15-5-10, 15-0-15, 22-3-14, 20-28-5 and 12-6-6.

118. The controlled release agricultural product of claim 99, wherein the fertilizer is a growth regulator selected from the group consisting of potassium azide, 2-amino-4-chloro-6-methyl pyrimidine, N-2, 5-dicorphenyl succinamide, 4-amino-1, and 2,4-triazole hydrochloride.

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119. The controlled release agricultural product of claim 99, wherein the fertilizer is a nitrification regulator selected from the group consisting of 2-chloro-6-trichloromethyl)pyridine, sulfathiazole, dicyandiamide, thiourea, and guanylthiourea.

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120. The controlled release agricultural product of claim 99, wherein the insecticide is 0,0-diethyl O-(2-isopropyl-6 methyl- 4 pyrimidinyl) phosphorothioate).

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121. The controlled release agricultural product of claim 99, wherein the herbicide is 2,4-dichlorophenoxyacetic acid.

122. The controlled release agricultural product of claim 99, wherein the fungicide is ferric-di-methyl-dithiocarbamate.

123. A process for preparing a controlled release agricultural absorbent based product comprising the following steps:

20 introducing a predetermined amount of water to particles of absorbent material containing capillaries/voids between 10-200 microns in cross-sectional diameter, to result in absorption of water within the absorbent material;

25 heating the absorbent particles and water to transform the water within the absorbent particles to steam;

introducing the heated absorbent particles to an agriculturally beneficial material in aqueous solution selected from the group consisting of fertilizers, insecticides, herbicides and fungicides for blending to essentially saturate the absorbent particles with the agriculturally beneficial material;

granulating the combination of agriculturally beneficial material and saturated absorbent particles to solidify and harden the mixture within the absorbent particles and outside the particles, resulting in the agglomeration of absorbent particles into granules; and

drying the granules.

124. The process of claim 123 wherein the combination of agriculturally beneficial material and saturated absorbent particles is heated while blending.

125. The process of claim 123 wherein the granulated combination of agriculturally beneficial material and saturated absorbent particles is screened to result in granules of a predetermined diameter.

126. The controlled release agricultural absorbent based product of claim 123 wherein the granules have a size of 0.2 - 25 mm in diameter.

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127. The process of claim 123 wherein undersized particles result from the screening step and are recycled back to the granulator where they agglomerate among themselves and among the incoming combination of agriculturally beneficial material and saturated absorbent particles.

128. The process of claim 123 wherein the combination of agriculturally beneficial material and saturated absorbent particles is introduced into the granulator by spraying means.

129. The process of claim 123 wherein the heating of the absorbent particles and water occurs in a heat exchanger.

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130. The process of claim 123 wherein the combination of agriculturally beneficial material and saturated absorbent particles are solidified and hardened by a loss of heat and/or increase of concentration of the agriculturally beneficial material.



131. The process of claim 123 wherein the absorbent material is selected from the group consisting of expanded perlite, shredded newspaper, saw dusts, cotton lint, ground corn cobs, corn cob flower, Metrecz absorbent and diatomaceous earth.

132. The process of claim 123, wherein the absorbent is impregnated in an amount of 70-95 % wt of the agricultural beneficial material.

133. The process of claim 123, wherein the fertilizer is secondary nutrients selected from the group consisting of sulfur, calcium and magnesium.

134. The process of claim 123, wherein the fertilizer is micronutrients selected from the group consisting of boron, copper, iron, manganese, molybdenum and zinc.

135. The process of claim 123, wherein the fertilizer is selected from the group consisting of nitrogen compounds, phosphorous compounds and potassium compounds.

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136. The process of claim 135, wherein the nitrogen compounds are selected from the group consisting of urea, ammonia, ammonium nitrate, ammonium sulfate, calcium nitrate, diammonium phosphate, monoammonium phosphate, potassium nitrate and sodium nitrate.

137. The process of claim 135, wherein the phosphorous compounds are selected from the group consisting of diammonium phosphate, monoammonium phosphate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

138. The process of claim 135, wherein the potassium compound is selected from the group consisting of potassium chloride, potassium nitrate, potassium sulfate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

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139. The process of claim 135, wherein the fertilizer contains nitrogen, phosphorous and potassium compounds in a ratio selected from the group consisting of 29-3-4, 16-4-8, 10-10-10, 15-5-10, 15-0-15, 22-3-14, 20-28-5 and 12-6-6.

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140. The process of claim 123, wherein the fertilizer is a growth regulator selected from the group consisting of potassium azide, 2 amino-4-chloro-6-methyl pyrimidine, N-2, 5-dicorphenyl succinamide, 4-amino-1, and 2,4-triazole hydrochloride.

141. The process of claim 123, wherein the fertilizer is a nitrification regulator selected from the group consisting of 2-chloro-6 trichloromethyl)pyridine, sulfathiazole, dicyandiamide, thiourea, and guanylthiourea.

142. The controlled release agricultural absorbent based product of claim 123, wherein the insecticide is 0,0-diethyl O-(2-isopropyl-6 methyl- 4 pyrimidinyl) phosphorothioate).

143. The controlled release agricultural absorbent based product of claim 123, wherein the herbicide is 2,4-dichlorophenoxyacetic acid.

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144. The controlled release agricultural absorbent based product of claim 123, wherein the fungicide is ferric-dimethyl-dithiocarbamate.

145. The process of claim 123 wherein the absorbent material is particles of perlite and the step of heating the absorbent particles and water to transform the water within the absorbent particles to steam, acts to exfoliate the perlite for improved subsequent adsorption of the agriculturally beneficial material.

146. The process of claim 123 wherein the exfoliated perlite has a loose weight density of 2-20 lb/ft<sup>3</sup>.

147. The process of claim 123 wherein the exfoliated perlite has a loose weight density of 2-6 lb/ft<sup>3</sup>.

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148. A process for preparing a controlled release agricultural absorbent based product comprising the following steps:

introducing a predetermined amount of water to particles  
5 of absorbent material containing capillaries/voids between 10-200 microns in cross-sectional diameter, to result in absorption of water within the absorbent material;

heating the absorbent particles and water to transform the water within the absorbent particles to steam;

60 mixing an interspatial blocker material and an agriculturally beneficial material in aqueous solution selected from the group consisting of fertilizers, insecticides, herbicides and fungicides;

introducing the heated absorbent particles to the mixture  
5 of agriculturally beneficial material and interspatial blocker for blending to essentially saturate the absorbent particles with the mixture of agriculturally beneficial material and interspatial blocker;

granulating the combination of agriculturally beneficial  
20 material, interspatial blocker and saturated absorbent particles to solidify and harden the mixture within the absorbent particles and outside the particles, resulting in the agglomeration of absorbent particles into granules; and drying the granules.

149. The process of claim 148 wherein the interspatial blocker is a material selected from the group consisting of plant starches, protein gels, glues, gumming compositions, crystallizing compounds, gelling clays, and synthetic gel  
5 forming compounds.

150. The process of claim 148 wherein the interspatial blocker is a starch selected from the group consisting of corn  
10 starch, rice starch, potato starch, wheat starch, tapioca starch, starch containing D-glucopyranose polymers, amylose and amylopectin. starch acetates, starch esters, starch  
ethers, starch phosphates  
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151. The process of claim 148 wherein the interspatial blocker is corn starch or wheat starch.

20 152. The process of claim 148 wherein the starches are modified by acetylation, chlorination, acid hydrolysis or enzymatic action.

25 153. The process of claim 148 wherein the interspatial blocker is a starch selected from the group consisting of

starch acetates, starch esters, starch ethers and starch phosphates.

5           154. The process of claim 148 wherein the interspatial blocker is a gelatin made by hydrolysis of collagen.

10           155. The process of claim 148 wherein the interspatial blocker is a glue made from a material selected from the group consisting of collagen, casein, blood and vegetable protein.

15           156. The process of claim 148 wherein the interspatial blocker is a gumming composition selected from the group consisting of cellulosics, rubber latex, gums, terpene resins, mucilages, asphalts, pitches and hydrocarbon resins.

20           157. The process of claim 148 wherein the interspatial blocker is a crystallizing compound selected from the group consisting of sodium silicate, phosphate cements, calcium-oxide cements and hydraulic cements.

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158. The process of claim 148 wherein the interspatial blocker is a synthetic gel forming compound selected from the group consisting of polysulfide sealants, polyethylene, isobutylene, polyamides, polyvinyl acetate, epoxy,  
5 phenolformaldehyde, urea formaldehyde, polyvinyl butyral, cyanoacrylates and silicone cements.

159. The process of claim 148 wherein the interspatial blocker is a gelling clay.

160. The process of claim 148 wherein the interspatial blocker is present in an amount of 0.01 - 20 % wt.

161. The process of claim 148 wherein the interspatial blocker is present in an amount of 0.5 - 6 % wt.

162. The process of claim 148 wherein the combination of agriculturally beneficial material and saturated absorbent particles is heated while blending.



163. The process of claim 148 wherein the granulated combination of agriculturally beneficial material and saturated absorbent particles is screened to result in granules of a predetermined diameter.

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164. The process of claim 148 wherein the granules have a size of 0.2 - 25 mm in diameter.

165. The process of claim 148 wherein undersized particles result from the screening step and are recycled back to the granulator where they agglomerate among themselves and among the incoming combination of agriculturally beneficial material and saturated absorbent particles.

166. The process of claim 148 wherein the combination of agriculturally beneficial material and saturated absorbent particles is introduced into the granulator by spraying means.

167. The process of claim 148 wherein the heating of the absorbent particles and water occurs in a heat exchanger.

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168. The process of claim 148 wherein the combination of agriculturally beneficial material and saturated absorbent particles are solidified and hardened by a loss of heat and/or increase of concentration of the agriculturally beneficial material.

169. The process of claim 148 wherein the absorbent material is selected from the group consisting of expanded perlite, shredded newspaper, saw dusts, cotton lint, ground corn cobs, corn cob flower, Metrecz absorbent and diatomaceous earth.

170. The process of claim 148 wherein the absorbent material is particles of perlite and the step of heating the absorbent particles and water to transform the water within the absorbent particles to steam, acts to exfoliate the perlite for improved subsequent adsorption of the agriculturally beneficial material.

171. The process of claim 148, wherein the absorbent is impregnated in an amount of 70-95 % wt of the agricultural beneficial material.

172. The process of claim 148, wherein the fertilizer is secondary nutrients selected from the group consisting of sulfur, calcium and magnesium.

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173. The process of claim 148, wherein the fertilizer is micronutrients selected from the group consisting of boron, copper, iron, manganese, molybdenum and zinc.

174. The process of claim 148, wherein the fertilizer is selected from the group consisting of nitrogen compounds, phosphorous compounds and potassium compounds.

175. The process of claim 174, wherein the nitrogen compounds are selected from the group consisting of urea, ammonia, ammonium nitrate, ammonium sulfate, calcium nitrate, diammonium phosphate, monoammonium phosphate, potassium nitrate and sodium nitrate.

176. The process of claim 174, wherein the phosphorous compounds are selected from the group consisting of diammonium phosphate, monoammonium phosphate, monopotassium phosphate,

dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

5           177. The process of claim 174, wherein the potassium compound is selected from the group consisting of potassium chloride, potassium nitrate, potassium sulfate, monopotassium phosphate, dipotassium phosphate, tetrapotassium pyrophosphate, and potassium metaphosphate.

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178. The process of claim 174, wherein the fertilizer contains nitrogen, phosphorous and potassium compounds in a ratio selected from the group consisting of 29-3-4, 16-4-8, 10-10-10, 15-5-10, 15-0-15, 22-3-14, 20-28-5 and 12-6-6.

179. The process of claim 148, wherein the fertilizer is a growth regulator selected from the group consisting of potassium azide, 2 amino-4-chloro-6-methyl pyrimidine, N-2, 5-dicorphenyl succinamide, 4-amino-1, and 2,4-triazole hydrochloride.

25           180. The process of claim 148, wherein the fertilizer is a nitrification regulator selected from the group consisting

of 2-chloro-6 trichloromethyl)pyridine, sulfathiazole, dicyandiamide, thiourea, and guanylthiourea.

5           181. The process of claim 148, wherein the insecticide is 0,0-diethyl O-(2-isopropyl-6 methyl- 4 pyrimidinyl) phosphorothioate).

10           182. The process of claim 148, wherein the herbicide is 2,4-dichlorophenoxyacetic acid.

15           183. The process of claim 148, wherein the fungicide is ferric-di-methyl-dithiocarbamate.

20           184. The process of claim 148, wherein the steps of combining water and the absorbent particles and then heating the combined absorbent particles and water to transform the water within the absorbent particles to steam are replaced by the step of directly introducing hot steam to the absorbent particles in order to produce absorbent particles containing steam.

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185. A process for preparing a controlled release agricultural product comprising the following steps:

mixing a control release holding substance selected from the group consisting of plant starches, protein gels, glues, gumming compositions, crystallizing compounds, gelling clays and synthetic gel forming compounds with an agriculturally beneficial material in aqueous solution selected from the group consisting of fertilizers, insecticides, herbicides and fungicides;

blending the mixture of agriculturally beneficial material and holding substance;

granulating the combination of agriculturally beneficial material and holding substance to solidify and harden the mixture, resulting in granules; and

drying the granules.

186. The process of claim 185 wherein the holding substance is a starch selected from the group consisting of corn starch, rice starch, potato starch, wheat starch, tapioca starch, starch containing D-glucopyranose polymers, amylose and amylopectin. starch acetates, starch esters, starch ethers, starch phosphates

187. The process of claim 185 wherein the holding substance is corn starch or wheat starch.

5 188. The process of claim 185 wherein the starches are modified by acetylation, chlorination, acid hydrolysis or enzymatic action.

10 189. The process of claim 185 wherein the holding substance is a starch selected from the group consisting of starch acetates, starch esters, starch ethers and starch phosphates.

15 190. The process of claim 185 wherein the holding substance is a gelatin made by hydrolysis of collagen.

20 191. The process of claim 185 wherein the holding substance is a glue made from a material selected from the group consisting of collagen, casein, blood and vegetable protein.

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192. The process of claim 185 wherein the holding substance is a gumming composition selected from the group consisting of cellulose, rubber latex, gums, terpene resins, mucilages, asphalts, pitches and hydrocarbon resins.

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193. The process of claim 185 wherein the holding substance is a crystallizing compound selected from the group consisting of sodium silicate, phosphate cements, calcium-oxide cements and hydraulic cements.

194. The process of claim 185 wherein the holding substance is a synthetic gel forming compound selected from the group consisting of polysulfide sealants, polyethylene, isobutylene, polyamides, polyvinyl acetate, epoxy, phenolformaldehyde, urea formaldehyde, polyvinyl butyral, cyanoacrylates and silicone cements.

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195. The process of claim 185 wherein the holding substance is a gelling clay.



196. The process of claim 185 wherein the combination of agriculturally beneficial material and holding substance is heated while blending.

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197. The process of claim 185 wherein the granulated combination of agriculturally beneficial material and holding substance is screened to result in granules of a predetermined diameter.

198. The process of claim 185 wherein the combination of agriculturally beneficial material and holding substance is introduced into the granulator by spraying means.

199. The process of claim 185 wherein the heating of the absorbent particles and water occurs in a heat exchanger.

200. The process of claim 185 wherein the combination of agriculturally beneficial material and holding substance are solidified and hardened by a loss of heat and/or increase of concentration of the agriculturally beneficial material.

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